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Users Manual for the ALAMO Demographic Report Generator Program (DEMCOM)

ORI, Inc.
Silver Spring, MD

Prepared for

Environmental Protection Agency
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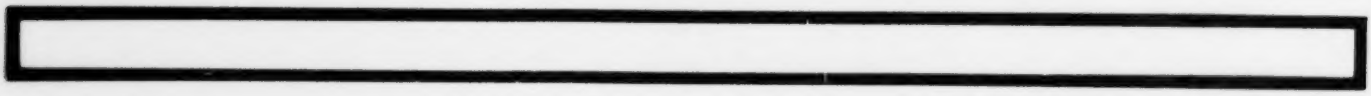

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USER'S MANUAL FOR THE ALAMO DEMOGRAPHIC REPORT GENERATOR PROGRAM (DEMCON)

SEPTEMBER 1981

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This report presents a discussion of the user requirements and procedures for executing the Demographic Report Generator Program. DEMCOM, a computer program written in FORTRAN IV programming language, uses as input the Aircraft Noise Levels and Annoyance Model (ALAMO) demographic profile reports which are generated for each octant of specified day-night sound level (L_{dn}) contour band and computes the same variables for the all-octant case. The program also projects selected demographic variables to future years based on historical growth rates for population, households, and per capita income.

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Silver Spring, Maryland 20910

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SEPTEMBER 1981

PREPARED UNDER:
CONTRACT No. 63-01-6267

FOR THE
OFFICE OF NOISE ABATEMENT AND CONTROL
U.S. ENVIRONMENTAL PROTECTION AGENCY

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I. INTRODUCTION

The computer program DEMCON is written in the FORTRAN IV programming language and is currently operational on the NASA Langley Research Center's (LRC) CDC computer complex. It uses as input the Aircraft Noise-Levels and Annoyance Model (ALAMO) demographic profile reports which are generated for each octant of specified Day-Night Sound Level (L_{dn}) contour band. DEMCON computes and outputs the same demographic variables for the all-octant case (i.e., a summation of all eight octants) for each of the following noise level contour bands (L_{dn} in dB): 55-60, 60-65, 65-70, 70-75, 75-80, 80-85, 85+, 65-75, and 75+.

The output format of DEMCON is similar to the standard demographic profile reports provided by CACI, Inc. The output consists of a variety of demographic information based on 1970 Bureau of Census statistics (with some 1977 updates) which describe the socio-economic environment in the surrounding airport community.* Projections for selected demographic variables may be

*ALAMO contains a large demographic data base management program developed by CACI, Inc. called SITE II. SITE II is capable of generating a demographic profile report for closed contours (size and shape essentially arbitary) located anywhere in the United States.

determined for the years 1979 and later. The projections are performed based on annual compound growth rates computed from the Population, Household and Per Capita Income data available in the standard demographic profile reports for both the year of the basic census data (1970) and for 1977.

To generate projection reports, assumptions are developed concerning aircraft fleet mixes, for number of departures, runway use, etc. for a given projection year. These data are then used to execute Integrated Noise Model (INM) runs which in turn generate ALAMO output reports reflecting census data for 1979 and 1977. To the extent the INM runs represent fleet mixes, etc. for a given forecast year, the projection procedures may be used to estimate demographic data comparable to that forecast year.

The following sections present a detailed discussion of the user requirements and procedures for executing the computer program, DEMCON. The computational algorithms used to determine demographic data projections are discussed in Appendix A.

II. INPUTS AND OUTPUTS

Program DEMCON uses two ALAMO input files and one ALAMO output file. A description of these files is presented below:

LOGICAL UNIT	FILE TYPE	Description
1	INPUT	Airport Location/Description Deck (file H of the ALAMO procedure, optionally modified to include projection data)
5	INPUT	Demographic Profile Reports (file G of the ALAMO procedure)
6	OUTPUT	Demographic variables for all-octant case of each L_{dn} band, for the baseline year plus projection years, if requested.

The Airport Location/Description Deck file on Unit 1 is the H file used in the ALAMO procedure. The first 3 records of this card format file are skipped by DEMCON; these contain data used by the ALAMO procedure. Records 4 and 5 contain the airport name and address, respectively. Record 6 (optional) contains demographic projection data. The format of the inputs on Unit 1 are shown on Table 1. A sample listing of the Airport Location/Description Deck file is shown on Figure 1.

The Demographic Profile Report file input on Unit 5 is the SITE II output file generated by the ALAMO runs. The data contained on Unit 5 are used to prepare the ALAMO demographic reports. The assumptions made concerning

TABLE 1

FORMATS OF THE INPUT DATA ON UNIT 1 FOR PROGRAM DEMCON

Record	Format	Column	Description
1			Records 1, 2, and 3 skipped by DEMCON Airport Latitude, Longitude, Displacement:
	I2	1-2	Latitude degrees
	I2	4-5	minutes
	I2	7-8	seconds
	I2	11-13	Longitude degrees
	I2	15-16	minutes
	I2	18-19	seconds
	A1	25	Displacement Direction (N or S)
	F5.2	26-30	Unsigned N/S displacement amount
	A1	32	Displacement Direction (E or W)
	F5.2	33-37	Unsigned E/W displacement amount
2	2F10.2	1-20	X and Y translation constants
3	F5.2	1-5	Scale factor for contour graphic, length of positive axis
4	8A10	1-80	80 character Airport Name (suggest 70 or less) placed on output.
5	8A10	1-80	80 character Airport Address (suggest 70 or less) placed in output.
6			Projection data (optional):
	4A10	1-40	40 character contour identifier, used on output report.
	8I5	41-80	Years for which projections are desired.

```
38 51 08   077 02 15
0.0        0.0
4.0
DCA NATIONAL AIRPORT
WASHINGTON, DC
1981 AIRPORT PROCEDURES                    1979 1985 1990 1995 2000
```

FIGURE 1. A SAMPLE LISTING OF THE AIRPORT LOCATION/DESCRIPTION DECK FILE (ON UNIT 1)

this report file are:

1. There is (at least) one report for each octant (1-8) for each L_{dn} contour. The contours are in order of increasing L_{dn} value over the range from 55 dB to 85 dB in 5 dB steps. If contours are missing, they are missing from the ends of the range, not the middle.

2. The absence of reported demographic data for a particular octant (i.e., the polygonal area was empty, as would occur if the area encompassed undeveloped land or if the L_{dn} contour did not extend beyond the airport boundary) may be determined by examining the first lines of the Demographic Profile Report containing the latest (1977) population data (see box, upper right corner of Figure 2). This situation occurs when the baseline population (as computed from the "LATEST" and "CHANGE FROM" data) is zero.

3. Column 1 contains carriage control characters. A sample listing of the Demographic Profile Report file is shown on Figure 2.

In addition to the two input files described above, there is one more piece of information which must be provided to program DEMCON. This information is the starting index to the seven possible contours available in the Demographic Profile Report file. This is provided via the R2 Job Control Register and is set and displayed by the ALAMO procedures during execution. If there are 5 contours found (out of the possible 7), this register must be set to 3, i.e., R2 is equal to eight (8) minus the number of contours found.

For the year of the input census data, the demographic variables output on Unit 6 are essentially in the same format as the standard demographic profile report. One report is output for each of the following L_{dn} contour bands (in dB), if these data are available: 55-60, 60-65, 65-70, 70-75, 75-80, 80-85, 85+ 65-75, and 75+. The only differences between the output formats of the standard Demographic Profile Report and the format used with the DEMCON program are:

1 DEMOGRAPHIC PROFILE REPORT PAGE 1

RUN NUMBER 1

LON 55.0 OCTANT 1, 6.64

	DEG	MIN	SEC
LATITUDE	38	51	8
LONGITUDE	77	2	15

7 POINT POLYGON

WEIGHTING PCT 100

	LATEST	CHANGE FROM 70
1977 POPULATION	80721	-3355
1977 HOUSEHOLDS	26425	2444
1977 PER CAP INCOME	$ 5688	$ 2929
ANNUAL COMPOUND GROWTH	-.6	

1970 CENSUS DATA

POPULATION		
TOTAL	84076	100.0
WHITE	25087	29.8
NEGRO	57860	68.8
OTHER	1129	1.3
SPAN	1516	1.8

FAMILY INCOME (000)		
$0-5	3638	19.3
$5-7	2870	15.2
$7-10	4197	22.3
$10-15	5025	26.7
$15-25	2671	14.2
$25-50	412	2.2
$50 +	34	.2
TOTAL	18847	
AVERAGE	$ 9834	
MEDIAN	$ 9084	

RENT		
$0-100	6100	30.8
$100-150	10508	53.1
$150-200	3046	15.4
$200-250	117	.6
$250 +	14	.1
TOTAL	19785	
AVERAGE	$ 116	
MEDIAN	$ 118	
RENTER	84.8	

UNITS IN STRUCTURE		
1	6113	35.5
2	557	2.3
3-4	1793	7.3
5-9	3502	14.6
10-49	10231	41.9
50 +	1990	7.3
MOBILE	52	.2

AGE AND SEX	MALE		FEMALE		TOTAL
0-5	6426	15.9	6270	14.4	15.1
6-13	7783	19.3	7713	17.7	18.4
14-17	2856	7.1	2753	6.3	6.7
18-20	1713	4.2	2953	6.8	5.5
21-29	8324	20.6	10001	22.9	21.8
30-39	5827	14.4	5733	13.1	13.7
40-49	3424	8.5	3388	7.8	8.1
50-64	2710	6.7	3068	7.0	6.9
65 +	1364	3.4	1800	4.1	3.8
TOTAL	40427		43649		
MEDIAN(AGE)	22.6		22.9		22.8

HOME VALUE (000)		
$0-10	33	.9
$10-15	359	10.1
$15-20	1244	35.1
$20-25	993	28.0
$25-35	732	20.7
$35-50	157	4.4
$50 +	27	.8
TOTAL	3542	
AVERAGE	$22444	
MEDIAN	$20682	
OWNER	15.2	

AUTOMOBILES		
NONE	7842	32.7
ONE	12561	52.4
TWO	3066	12.8
THREE+	481	2.0

HOUSEHOLDS WITH:		
TV	22121	92.2
WASHER	8733	36.4
DRYER	4312	18.0
DISHWSH	2498	10.4
AIRCOND	11532	48.1
FREEZER	3084	12.9
2 HOMES	440	1.8

OCCUPATION		
MGR/PROF	5078	18.6
SALES	1114	4.1
CLERICAL	10350	37.9
CRAFT	2420	8.9
OPERTIVS	2579	9.4
LABORER	1118	4.1
FARM	46	.2
SERVICE	4249	15.6
PRIVATE	344	1.3

EDUCATION	ADULTS > 25	
0-8	7904	21.6
9-11	8745	23.9
12	13307	36.4
13-15	3821	10.4
16 +	2823	7.7

HOUSEHOLD PARAMETERS		
FAM POP	70916	84.3
INDIVIDS	7524	8.9
GRP QTRS	5636	6.7
TOT POP	84076	

NO OF HH'S	23981
NO OF FAM'S	18772
AVG HH SIZE	3.3
AVG FAM SIZE	3.8

FIGURE 2. A SAMPLE LISTING OF THE DEMOGRAPHIC PROFILE REPORT FILE (ON UNIT 5)

LINE	DESCRIPTION OF DIFFERENCE IN OUTPUT
1	Contour band sequence number is output instead of page number
2	Airport name is output (first 79 characters in columns 2-80)
3	Airport address is output (first 79 characters in columns 2-80)
4	L_{dn} value, AREA, and OCTANT number are NOT output
10	L_{dn} contour band limits are output instead of the number of points in the polygon.

The format of the remainder of the report is unchanged from the standard demographic report. A sample listing of the output report for program DEMCON is shown on Figure 3.

If the user chooses, there is also a brief output report for up to 8 projection years for each of the L_{dn} contour bands. The projections are made from the census data year to 1979 based on annual compound growth rates in population, households, and per capita income, as well as on national trends in housing and rental values. The projections are based on constant (1979) dollars. Accordingly, variables reflecting dollar values are not indexed beyond the year 1979 to account for inflationary increases. These growth rates are computed from the census data and the updated values found in the standard demographic profile reports. Based on these same data, projections are then made to years beyond 1979 using the annual compound growth rate in households. A sample listing of the output for projected demographic variables is shown on Figure 4.

DCA NATIONAL AIRPORT
WASHINGTON, DC

DEMOGRAPHIC PROFILE REPORT CONTOUR 2

	DEG	MIN	SEC
LATITUDE	38	51	8
LONGITUDE	77	2	15

LON 55-60 08

WEIGHTING PCT 100

	LATEST	CHANGE FROM 70
1977 POPULATION	403811	-8612
1977 HOUSEHOLDS	152750	6681
1977 PER CAP INCOME	$ 7304	$ 2577
ANNUAL COMPOUND GROWTH	-.3	

1970 CENSUS DATA

POPULATION		
TOTAL	412423	100.0
WHITE	272651	66.1
NEGRO	133914	32.5
OTHER	5858	1.4
SPAN	12072	2.9

FAMILY INCOME (000)		
$0-5	13787	14.0
$5-7	8674	8.8
$7-10	14595	14.9
$10-15	22634	23.0
$15-25	24685	25.1
$25-50	12002	12.2
$50 +	1868	1.9
TOTAL	98245	
AVERAGE	$15080	
MEDIAN	12666	

RENT		
$0-100	25676	28.3
$100-150	37077	40.9
$150-200	18674	20.6
$200-250	4336	4.8
$250 +	4902	5.4
TOTAL	90665	
AVERAGE	$ 133	
MEDIAN	$ 127	
RENTER	64.3	

UNITS IN STRUCTURE		
1	66251	45.4
2	3187	2.2
3-4	6837	4.7
5-9	9993	6.8
10-49	28421	19.5
50 +	30751	21.1
MOBILE	637	.4

AGE AND SEX

	MALE		FEMALE		TOTAL
0-5	19754	10.1	19395	8.9	9.5
6-13	30988	15.9	30750	14.1	15.0
14-17	14743	7.6	14704	6.8	7.1
18-20	8514	4.4	11650	5.4	4.9
21-29	30684	15.8	34637	15.9	15.8
30-39	25264	13.0	25721	11.8	12.4
40-49	25134	12.9	28530	13.1	13.0
50-64	27723	14.2	32254	14.8	14.5
65 +	11888	6.1	20078	9.2	7.8
TOTAL	194692		217719		
MEDIAN(AGE)		27.8		29.4	28.7

HOME VALUE (000)		
$0-10	602	1.2
$10-15	2771	5.5
$15-20	7524	15.0
$20-25	7221	14.4
$25-35	11691	23.3
$35-50	11885	23.7
$50 +	8539	17.0
TOTAL	50233	
AVERAGE	$33912	
MEDIAN	$30986	
OWNER	35.7	

AUTOMOBILES		
NONE	44208	30.3
ONE	61702	42.3
TWO	33968	23.3
THREE+	6155	4.2

HOUSEHOLDS WITH:		
TV	131105	33.1
WASHER	71207	18.0
DRYER	46855	11.8
DISHWSH	41055	10.4
AIRCOND	74516	18.8
FREEZER	26927	6.8
2 HOMES	3958	1.0

OCCUPATION		
MGR/PROF	56041	34.8
SALES	9184	5.7
CLERICAL	45831	28.5
CRAFT	12908	8.0
OPERTIVS	9753	6.1
LABORER	4514	2.8
FARM	260	.2
SERVICE	18859	11.7
PRIVATE	3535	2.2

EDUCATION	ADULTS > 25	
0-8	39955	17.3
9-11	37876	16.4
12	63695	27.6
13-15	32591	14.1
16 +	56314	24.4

HOUSEHOLD PARAMETERS		
FAM POP	342142	83.0
INDIVIDS	63447	15.4
GRP QTRS	6834	1.7
TOT POP	412423	
NO OF HH'S	146069	
NO OF FAM'S	99041	
AVG HH SIZE	2.8	
AVG FAM SIZE	3.5	

FIGURE 3. SAMPLE LISTING OF THE OUTPUT FOR PROGRAM DEMCON (ON UNIT 6)

DEMOGRAPHIC REPORT

MIAMI INTERNATIONAL
MIAMI, FLORIDA

PROJECTION YEAR 1979 FROM 1970 CENSUS DATA WITH 1977 UPDATES

LON 73-75 OR + CONTOUR 4 MIAACBLM41

POPULATION (ANNUAL COMPOUND GROWTH -.2%)

RACE		%
WHITE	46659	63.2
NEGRO	6804	9.2
OTHER	430	.6
TOTAL	73892	100.0
SPANISH	43312	58.9

AGE		%
0- 5	5519	7.5
6-13	9276	12.6
14-17	4362	5.9
18-20	3277	4.4
21-29	8413	11.4
30-39	9451	12.8
40-49	10659	14.4
50-64	13816	18.7
65+	9121	12.3
TOTAL	73892	
MEDIAN		36.5 YRS

PER CAPITA INCOME $ 5922 (ANNUAL COMPOUND GROWTH 9.4%)

HOUSEHOLDS (ANNUAL COMPOUND GRO.TH 2.6%)

NUMBER OF HOUSEHOLDS 28459 AVERAGE SIZE 2.6

HOMES	(39.5%)	RENTAL	(60.5%)	FAMILY INCOME	
NUMBER	11243	NUMBER	17216		
AVERAGE $	31403	AVERAGE $	171	AVERAGE $	15382
MEDIAN $	29495	MEDIAN $	174	MEDIAN $	13691

UNITS/STR	UNITS	STRUCT
1	17154	17154
2	2276	1048
3- 4	1780	518
5- 9	3120	909
10-49	4766	1758
50+	850	11
TOTAL	29946	21396
MOBILE	916	

HOUSEHOLDS WITH:		%
TV	13700	48.7
WASHER	6415	22.9
DRYER	1542	5.5
DISH.WSH	942	3.7
AIR COND	7166	27.4
FREEZER	801	2.9
2 HOMES	162	.7

Reproduced from best available copy.

FIGURE 4. SAMPLE LISTING OF THE OUTPUT FOR PROJECTED DEMOGRAPHIC VARIABLES

III. PROGRAM EXECUTION

The source code for program DEMCON has been stored on the NASA LRC computer system under the name DEMCONS. The compiled binary object module has been stored under the name DEMCONB. The OPL library module is needed for compilation of the CDC Compass routine. To re-compile DEMCON the following procedure is used:

```
ATTACH,OPL/UN=LIBRARY.
FTN,I=DEMCONS,B=DEMCONB,L=DEMCONL,R=3.
REPLACE,DEMCONB,DEMCONL.
```

This procedure will compile the source code DEMCONS and place the binary output in DEMCONB, replacing the existing binary on that file. The listing of the compilation will be placed on DEMCONL, replacing any existing listing on that file.

To make an executable load module of DEMCON, the following commands are performed:

```
LDSET,MAP=SBEX/DEMCONM.
LOAD,DEMCONB.
NOGO,DEMCONA.
REPLACE,DEMCONA,DEMCONM.
```

These commands will create an absolute, executable load module on the file DEMCONA, and will put the load map on file DEMCONM. Any existing files by those names will be replaced.

To execute the DEMCON report generator program, the user must first set the R2 control register to the starting index of the L_{dn} contours. DEMCON assumes that the seven possible contours (55+, 60+, 65+, 70+, 75+, 80+, 85+) are available in order of increasing L_{dn} value in file 5. If there are N contours to be found, R2 must be set to 8-N (e.g., start with 2 if there are 6 contours). R2 is set and displayed by the ALAMO procedure.

To execute DEMCON, the following commands are given:

SET (R2 = n)

DEMCONA,file-G,line-printer,,,file-H.

where n is the proper value of the R2 register.

line-printer is the name of the file to contain the line printer output (default name is OUTPUT)

file-G is the name of Unit 5 input file

file-H is the name of the Unit 1 input file.

APPENDIX A

COMPUTATIONAL ALGORITHMS

APPENDIX A
COMPUTATIONAL ALGORITHMS

ALL-OCTANT SUMMATION

The variables presented in the demographic profile reports are read in octant-by-octant for each contour noise level and summed over all octants. They are then differenced to compute the aggregate data for the contour bands. The percentages and medians are then computed for the all-octant case for each contour band. In cases where the total of a particular variable is zero, the category percentages will also be given a value of zero. The median of a set of variable categories may fall in the final, open-ended category; in this case the median cannot be computed and is given a value of zero. An example of this would be the following set of home value counts:

HOME VALUE (000)	
$0-10	0
$10-15	0
$15-20	0
$20-25	3
$25-35	9
$25-50	9
$50+	34

The averages for family income, home value, and rent, as well as the per capita income data, are computed from the average of each octant weighted by the summation of each variable's values over all octants.

UPDATING PROCEDURE

The procedure for updating selected demographic variables proceeds in two steps. The first step begins with computation of annual compound growth rates for those variables for which two data points are available -- total population, number of households and per capita income. The growth rate is computed as:

$$r_X = \left(\frac{X_{1970}}{X_y} \right)^{y-1970} - 1 \qquad \text{(A-1)}$$

where: X = variable of interest, either population (P), households (H) or per capita income (K)

y = year for which updated ALAMO data is available, normally 1977 (see box, upper right corner of Figure 3).

Based on these compound growth rates, selected variables are updated to the base-line year 1979, as follows:

$$X_{1979} = X_{1970}(1 + r_X)^9 \qquad \text{(A-2)}$$

where: X = variable of interest (P, H or K)

r = annual compound growth rate

Other variables (e.g., number of renters, number of homeowners, number of housing units, etc.) are updated to 1979 values based on the annual compound growth rates for households using equation A-2.

For average/median rent and home values, the update to 1979 values is based on national trends in rental and housing values, indexed to 1970 values. The computation is:

$$RV_{1979} = 1.60\ RV_{1970} \qquad \text{(A-3)}$$

$$HV_{1979} = 1.89\ HV_{1970} \qquad \text{(A-4)}$$

where: RV = monthly rental value

HV = home value.

The second step of the process involves projections to the post-1979 period, normally 1985, 1990, 1995 and 2000. Here, all variables associated with a monetized value, such as average rent or home value, remain constant so that projections are presented in constant (1979) dollars. For other variables, the projections are based on the same annual compound growth rate as follows:

$$Z_T = Z_{1979}\ (1 + r_H)^{T-1979} \qquad \text{(A-5)}$$

where: T = the post-1979 year for which updates are desired

Z = variable of interest, either population (P), total households (H), number of renters (R), number of homeowners (HO) and number of housing units (U)

r_H = annual compound growth rate for households.

For a more complete explanation of the updating procedure, see ORI letter report dated July 1981, entitled Procedures to Update Selected Demographic Variables.